Dr. Lauren E. **Mc Keown**

JPL Postdoctoral Fellow

Jet Propulsion Laboratory, 4800 Oak Grove Dr, Pasadena, CA, 91109

626-319-1977 | lauren.mckeown@jpl.nasa.gov | www.laurenevemckeown.com

Summary

I am a planetary scientist with a specialisation in studying icy planetary surface processes through remote-sensing and laboratory analogue work. I have a cross-disciplinary background, with a PhD in the topic of Martian geomorphology and a First Class Honours degree in Physics with Astronomy and Space Science. I have experience as an academic lecturer at Birkbeck, University of London and research experience at NASA Ames, The Open University and The Natural History Museum. I have also worked in project management at The University of Cambridge. I am passionate about STEM outreach and creating a more equitable, diverse and inclusive culture in academia.

Education

Ph.D. in Planetary Science

Dublin, Ireland

Trinity College Dublin — *2014–2018*

- Thesis: An Investigation of the Role of Sublimating CO_2 as a Geomorphic Agent on Mars. Supervisors: Dr. Mary Bourke, Prof. Jim McElwaine.
- PI on successful Europlanet Grant proposal. Independently designed, curated and orchestrated EU Horizon 2020 - funded experiments at The Open University Mars Simulation Chamber investigating the interaction between sublimating CO_2 ice and Mars regolith analog samples.
- PI on successful Irish Research Council Government of Ireland Postgraduate Scholarship proposal to investigate active Martian surface processes via remote sensing and laboratory analogue work
- Surveyed linear gullies and araneiforms on Mars, measured seasonal change in Mars Reconnaissance Orbiter's HiRISE DTMs and orthophotos.
- Delivered Q1 journal publications and disseminated results internationally.

B.Sc. Physics with Astronomy and Space Science

Dublin, Ireland

University College Dublin — *2009-2013*

- First Class Honours, GPA: 3.92
- Year 1: Won entrance scholarship based on entry level highest grades.
- Year 2: Won stage 2 scholarship for highest exam results on the course.
- Year 3: Study Abroad at San José State University
- Selected to participate in Intel Ideation Camp at NASA Ames
- Final Year Project: Space Mission Design (A). Collaborated with the University of Southampton to design a gamma ray detection space mission.

Professional Experience

JPL Postdoctoral Fellow

Pasadena, CA

NASA Jet Propulsion Laboratory — *Jan 2022–present*

- Investigating Martian spider formation by CO_2 sublimation via analogue laboratory experiments and remote sensing image analysis.
- Cataloging different classes of dendritic features, spanning araneiforms and dendritic troughs.
- Characterizing the present-day surface and frost environment at araneiform and dendritic trough sites.
- Conducting correlative analysis of environmental conditions at dendritic trough sites
- Leading planetary analog laboratory experiments to constrain remote-sensing image data analysis.

Associate Research Fellow

London, UK

Birkbeck, University of London — *Jan 2022-present*

- Honorary association with College.

Tenured Lecturer in Planetary Surfaces

London, UK

Birkbeck, University of London — *Aug 2021–Dec 2021*

- Contributing to teaching and research in the field of planetary surfaces.
- Lecturing in Geology of the Solar System II.
- Lecturing in Remote Sensing and Planetary Surfaces
- Helping to develop new modules in the fields of planetary science and space exploration.
- Supervising H. Kreider M.Sc thesis at University College London in collaboration with Dr. Ramy El Maary at Khalifa University, Abu Dhabi.

Honorary Lecturer

London, UK

University College London — *Aug 2021–Dec 2021*

Associate Lecturer

London, UK

Birkbeck, University of London — *Jan 2021–Aug 2021*

- Lecturing in Geology of the Solar System II.
- Received 100% feedback from students in student review.

Postdoctoral Research Associate

Milton Keynes, UK

The Open University

March 2021–July 2021

- Preparation of laboratory experiments on collisions of mm and cm-sized icy grains under low temperature and vacuum conditions in order to understand how ensembles of icy interstellar grains aggregate around the snowline in proto-planetary disks during planetary formation.

Postdoctoral Researcher

Remote

Utopia-Argyre Periglacial Working Group

Sept 2020–Jan 2021

- Mapping and statistical analysis of putatively periglacial surface features on Mars using high resolution remote–sensing images.

Fact Checker

Dublin, Ireland

The Irish Times Space Camp, sponsored by Cadbury's Ireland

Jul 2020 - Sept 2020

- Fact checking scientific content relating to the Solar System and space exploration for a video series published online.
- Assisting with planetary science script writing for TV personalities and science communicators Mark the Science Guy and Dr. Norah Patten.

Postdoctoral Research Associate

London, UK

Planetary Surfaces Group, Natural History Museum

Jul 2019–Jul 2020

- Analysed multi–wavelength remote–sensing datasets of the Martian surface to identify 6 possible source locations of Martian meteorites.
- Mapped >10,000 craters using ArcMap 10.
- Used crater age–dating and model fits to date 118 ejecta blankets and underlying material.

Founder and Art Teacher

Cambridge, UK

Brews & Brushstrokes

Aug 2019–Dec 2020

- Managing and teaching at public and corporate art events. Running online classes, communicating with students, applying a range of teaching and learning methodologies to both beginner and advanced-level students. Originally taught classes of up to 60 people, moved to online.

Project Manager

Cambridge, UK

Textile Two Dimensional, University of Cambridge

Apr 2019-Jul 2019

- Agile project management at a startup spun out of the University of Cambridge and funded by the Royal Academy of Engineering. Managed medium–scale projects from start to completion. Communicated difficult scientific concepts to investors during pitching events.

Postdoctoral Research Associate

Remote

Utopia-Argyre Periglacial Working Group

Oct 2018–Apr 2019

- Worked as part of an international consortium of researchers analysing remote–sensing images of potentially periglacial features on Mars.
- Applied relative stratigraphy and comparative planetology to investigate whether mid–high–latitude mounds are thermokarst features.
- Mapped high–centered and low–centered polygons and statistically analysed these data in Matlab to test ice–wedging formation hypothesis.

NASA International Intern

Mountain View, California

NASA Ames

Jun-Aug 2015

- One of two Irish PhD students selected and funded to partake in the NASA International Internship Programme by the Irish Research Council.
- Analysed NASA astrobiology empirical datasets on metabolic control for long-haul spaceflight to Mars. Advisor: Dr. Yuri Griko.
- Investigated methods to monitor Enceladus' plume from Earth. Advisor: Dr. Chris McKay.

Research Assistant

Dublin, Ireland

Cool Stars Group, Department of Physics, Trinity College Dublin

Sept 2013-Sept 2014

- Independently operated CARMA radio telescope array in California to acquire radio measurements of stellar atmospheric thermodynamics.

Publications

The Formation of Araneiforms by Carbon Dioxide Venting and Vigorous Sublimation Dynamics Under Martian Atmospheric Pressure

Nature Scientific Reports

Mc Keown, L.E., McElwaine, J.N., Bourke, M.C., Sylvest, M.E., Patel, M.R.

2021

- Online, open access
- Press coverage: National Geographic, Universe Today, CNN, ITV News, The Independent, Esquire, The Irish Independent, The Irish Times and 200+ news outlets worldwide

Experiments on Sublimating Carbon Dioxide Ice and Implications for Contemporary Surface Processes on Mars

Nature Scientific Reports

McKeown, L.E., Bourke, M.C., McElwaine, J.N.

2017

- Online, open access
- Press coverage: The Planetary Society, International Business Times and 50+ news outlets worldwide

Modern Mars Geomorphological Activity, Driven by Wind, Frost and Gravity

Geomorphology

Diniega, S., Bramson, A.M., Buratti, B., Buhler, P., Burr, D.M., Chojnacki, M., Conway, S.J., Dundas, C.M., Hansen, C.J., McEwen, A.S., **Mc Keown,** L.E., Lapôtre, M.G.A., Levy, J., own, L.E., Piqueux, S., Portyankina, G., Swann, C., Titus, T.N., Widmer, J.N.

2021

- Online, open access, invited review paper

Possible Ice-wedge Polygonisation in Utopia Planitia, Mars and its Poleward Gradient with Latitude — *Icarus*

Soare, R.J., Philippe, M., Conway, S.J., Williams, J-P., **Mc Keown,** L.E., Godin, E., Hawkswell, J. — *2020*

- Online, open access

Possible Pingo and Ice-Wedge/Thermokarst Complexes at the Mid Latitudes of Utopia Planitia, Mars — *Icarus*

Soare, R.J., Conway, S.J., Williams, J.P., Gallagher, C., **McKeown,** L.E. — *2019*

- Online, open access

The freeze-thaw cycling of water and landscape evolution on Mars; why not? — *Elsevier*

Soare, R., Costard, F., Williams, J.-P., Gallagher, C., Hepburn, A.J., Stillman, D., Koutnik, M., Conway, S.J., Philippe, M., Butcher, F.E.G., **Mc Keown,** L.E., Godin, E. — *In Press*

- Book chapter in 'Ice is Nice: a Volatile-Rich Journey from the Inner to the Outer Solar System'

An Updated Global Catalogue of Rayed Craters on Mars: Potential Source Locations for Martian Meteorites — *Earth and Space Science*

Harris, J.K., **Mc Keown**, L.E., Parenti, C., Grindrod, P.M., Tornabene, L.L. — *Under Review*

Late Amazonian Epoch glacial deposits on Mars: Using setting, structure and stratigraphy to understand ice evolution and climate history — *Elsevier*

Koutnik, M., Brough, S., Butcher, F., Gallagher, C., Hepburn, A., Hubbard, B., **Mc Keown**, L.E., Pathare, A., Soare, R. — *In Preparation*

- Book chapter in 'Ice is Nice: a Volatile-Rich Journey from the Inner to the Outer Solar System'

Morphometric Trends and Implications for the Formation of Araneiforms — *N/A*

Mc Keown, L.E., Bourke, M.C., Schwamb, M., Portyankina, G., Hansen, C.J. — *In Preparation*

Empirically-tested Experiments of CO_2 Block Sublimation Theory Under Martian Pressure — *N/A*

Mc Keown, L.E., McElwaine, J.N., Bourke, M.C., Sylvest, M.E., Patel., M.R. — *In Preparation*

Mars as a "Natural Laboratory" for Studying Surface Activity on a Range of Planetary Bodies — *Planetary Sciences Decadal Survey*

Diniega, S. et al (including **Mc Keown,** L.E.) — *2020*

- White paper

A Case for Mars Polar Science in the Solar System — *Planetary Sciences Decadal Survey*

Smith, I.B. et al (including **Mc Keown,** L.E.) — *2020*

White paper

Selected Conference Presentations

Spiders on Mars Simulated in the Laboratory — *London, UK*

McKeown, L.E. — *Sept, 2021*

- UCL/Birkbeck Centre for Planetary Sciences Summer Meeting

INVITED: Experiments on CO_2 Sublimation on Granular Substrate Under Mars Conditions — *London, UK*

McKeown, L.E. — *March, 2020*

- UKI Europlanet Hub Science Meeting

INVITED: A Review of Martian CO_2 Sublimation Processes and Their Field and Laboratory Analogs — *Ushuaia, Argentina*

McKeown, L.E., Diniega, S., Portyankina, G., Aye, K.-M., Hansen, C.J. — *Jan 2020*

- 7th International Conference on Mars Polar Science and Exploration

An Updated Global Catalogue of Rayed Craters on Mars: Potential Sources for Martian Meteorites — *San Francisco, USA*

Mc Keown, Grindrod, P.M., Harris, J.K., Parenti, C. — *Dec, 2019*

- 100th American Geophysical Union Fall Meeting

An Investigation of the Physical Constraints on Araneiform Morphometry — *Texas, USA*

Mc Keown, L.E., Bourke, M.C., McElwaine, J.N., Sylvest, M.E., Patel, M.R. — *March, 2019*

- 50th Lunar and Planetary Science Conference

PSI Pierazzo Award Talk: A Quantitative Comparison Between Theory And Experiment for CO2 Sublimation on a Granular Surface under Terrestrial and Martian Conditions and Morphological Results — *Texas, USA*

Mc Keown, L.E., McElwaine, J.N., Bourke, M.C., Sylvest, M.E., Patel, M.R. — *March 2018*

- 49th Lunar and Planetary Science Conference

Carbon Dioxide Ice Sublimation: An Agent of Contemporary Martian Surface Feature Formation — *Texas, USA*

McKeown, L.E., Bourke, M.C., McElwaine, J.N. — *March, 2017*

- 49th Lunar and Planetary Science Conference

An Investigation of the Potential Role of Carbon Dioxide Sublimation in Linear Gully Pit Formation on Mars — *Reykjavik, Iceland*

Mc Keown, L.E., Bourke, M.C., McElwaine, J.N. — *2016*

- USRA 6th International Conference on Mars Polar Science and Exploration

Grants & Awards

2021	**CO-I: NASA ROSES Mars Data Analysis Research Grant,** To perform analog Martian icy surface processes experiments and remote sensing data analysis.	*Pasadena, CA*
2020	**International Mars Polar Science and Exploration Conference Travel Grant,** To present an invited talk at the 7th International Mars Polar Science and Exploration Conference.	*Ushuaia, Argentina*
2018	**Planetary Science Institute Pierazzo International Student Travel Award,** Awarded to one non-U.S. student annually.	*Texas, USA*
2017	**Mars Periglacial Research Grant,** To conduct a survey of putatively periglacial Martian surface features.	*Quebec, CA*
2017	**PI: Europlanet European Union Horizon 2020 Award,** To design and perform quantitative laboratory experiments at the Open University Mars Simulation Chamber.	*Milton Keynes, UK*
2015	**PI: Irish Research Council Government of Ireland Postgraduate Scholarship,** Funded 3 years of PhD including travel and research expenses.	*Dublin, Ireland*
2016	**European Geophysical Union Postgraduate Travel Award,** To present at the USRA 6th International Conference on Mars Polar Science and Exploration	*Reykjavik, Iceland*
2016	**International Association of Sedimentologists Award,** To present at the Martian Gullies workshop.	*London, UK*
2015	**Irish Research Council NASA International Student Internship,** One of two Irish postgraduate students selected. Travel, accommodation, stipend and visa to complete internship at NASA Ames Research Center.	*California, USA*
2014	**Trinity Award Postgraduate Scholarship,** One year of PhD funded.	*Dublin, Ireland*
2014	**Science Foundation Ireland Research Studentship,** Research on stellar atmospheres funded.	*Dublin, Ireland*
2010	**University College Dublin Undergraduate Scholarship,** Awarded to highest GPA. University fees funded.	*Dublin, Ireland*
2009	**University College Dublin Entrance Scholarship,** Awarded based on highest entry level high school grades. University fees funded.	*Dublin, Ireland*

Scientific Evaluation/Reviewing Activities

Planetary and Space Science (2021), JGR: Planets (2019, 2018), Icarus (2019), Geological Society London (2018, 2017)

Organisation of International Conferences

2022	**Conference Co-organiser**, Martian Enigmas: from the Late Noachian Epoch to the Present	*Houston, Texas*
Jul 2019	**Co-convenor**, Quaternary Mars session, 20th International Union for Quaternary Research Congress	*Dublin, Ireland*
Mar 2019	**Chair**, Processes on Modern Mars session, 50th Lunar and Planetary Science Conference	*Houston, Texas*
Sept 2016	**Chair**, Active Surface Processes session, 6th International Conference on Mars Polar Science and Exploration	*Reykjavik, Iceland*

Teaching & Supervision

2021-present	**M.Sc. Secondary Supervisor**, H. Kreider Research Thesis, University College London	*London, UK*
2021	**Associate Lecturer**, Geology of the Solar System II, Department of Earth and Planetary Sciences, Birkbeck	*London, UK*
2009–2019	**Mathematics Tutor**, Individual and small group teaching, in person and online	*Dublin, Ireland*
2016	**Teaching Assistant**, Changing Worlds, Geography Department, Trinity College Dublin	*Dublin, Ireland*
2016	**Teaching Advisor**, Junior Cycle Science Curriculum, Science Gallery, Trinity College Dublin	*Dublin, Ireland*
2013	**Laboratory Demonstrator**, Undergraduate Theoretical Physics, Physics Department, Trinity College Dublin	*Dublin, Ireland*

Professional Qualifications & Courses Taken

Postgraduate Teaching and Learning Course — *Dublin, Ireland*

Trinity College Dublin — *2013*

- Course which instructed upon how to teach undergraduates; teaching practices, communicating scientific topics, working with diverse students, relating to student needs, engaging interest and enthusiasm, diverse teaching and assessment methodologies, reflective practice

PRINCE2® Foundation Project Management Certification — *London, UK*

The Knowledge Academy — *2019*

Selected Media Engagements & Outreach

2022	**Feature in The Times**, Feature on my career in planetary science as an Irish woman and my dream of working for NASA since teenage years.	*In print, Online*
2021	**Planetary Geomorphology Image of the Month for the month of June, 2021**,	*Online*
2021	**Lauren Mc Keown science blog**, In collaboration with Featherwax post production, this blog aims to share my research and describe planetary surface processes that have no Earth analogues using artistic post-production movies and engaging with the general public via Twitter.	*Online*
2021	**Mars Reconnaissance Orbiter HiRISE Science Nugget**, Invited by the HiRISE science team to publish a science nugget on spider laboratory research on the HiRISE website and to share with NASA HQ	*Arizona, USA*
2021	**The World Radio Show**, Radio Interview on Spiders from Mars in the Laboratory	*Boston, USA*
2021	**Blackrock Castle Observatory**, Space Careers Video for Kids	*Dublin, Ireland*
2021	**Dublin's Q102 Radio Station**, Interview on Martian spiders in the laboratory	*Dublin, Ireland*
2020	**Panel Speaker: International Women's Day Museum Lates**, Natural History Museum	*London, UK*
2019	**Keynote Speaker: Lost Lectures, 50th Anniversary Moon Landing Talk**, Natural History Museum	*London, UK*
2018	**Cool Science and Curious Minds Podcast**, Ep 7, Mars Landing Sites	*Dublin, Ireland*
2017	**WeMartians Podcast**, Ep 21, LPSC, Interview, CO2 sublimation on Mars	*Houston, Texas*
2017	**Invited Speaker: FM104 Radio Regular Segment**, A Career in Planetary Science	*Dublin, Ireland*

Skills

Teaching	Lecturer in geology of the Solar System, undergraduate university teaching in geography and physics at Trinity College Dublin, developing course content, amending course structure to fit the state of the art, organising guest speakers in planetary science, designing module assessments to fit move to online, running module via Moodle, answering student queries, managing a diverse range of students from mature students on a certificate level course, to undergraduate students, writing exams, marking assignments and exams, online teaching, individual tutoring, PhD student co-supervision, international speaking engagements, science communication engagements with large audiences, working as part of a departmental team, discussing ways to improve module and courses with colleagues
Planetary Science	Remote–sensing studies of planetary surfaces, image and DTM analysis of active Martian surface processes in ArcGIS, Matlab, JMARS and Python statistical analysis applied to geophysical research, mapping, photogrammetry, 3D model development with Agisoft Metashape, Laboratory experiment design, scale extrapolation, sample handling, operating planetary simulation facility, hardware installation, LabView, numerical modelling and validation, field and laboratory analogue research
Project Management	PRINCE2®certified, agile project management, preparing reports, coordinating and chairing meetings
Programming	Matlab, Python, Bash, LaTeX
Geospatial Information Systems	ESRI ArcGIS, QGIS, JMARS
Software & Operating Systems	Microsoft Excel, Word, Moodle, Powerpoint, Photoshop, OneNote, Windows, Linux, Mac
Other	Art, gym, creative writing, reading recreationally

References

Dr. Mary Bourke — *Relationship: Ph.D. supervisor*

BOURKEM4@TCD.IE — *Trinity College Dublin*

Dr. Chris McKay — *Relationship: Internship Mentor*

CHRIS.MCKAY@NASA.GOV — *NASA Ames*

Dr. Yuri Griko — *Relationship: Internship Mentor*

YURI.V.GRIKO@NASA.GOV — *NASA Ames*